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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/707,687

01/05/2004

Kai-Chi Chen

11843-US-PA

1686

31561

7590

03/29/2006

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 03/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/707,687

Applicant(s)

CHEN ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This office action is in response to the amendment filed December 28, 2005.

Response to Arguments

2. Applicant's arguments with respect to claims 1 and 3-8 have been considered but are moot in view of the new ground(s) of rejection.

Drawings

3. The drawings are objected to because of the following: a) please change “(Prior Art)” to “Prior Art” (See Figures 1-3)(remove the parentheses). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 4-6 and 8 are rejected under 35 U.S.C. 103(a) as obvious over Chia et al. (U.S. Patent No. 6,225,695) in view of Yamada et al. (U.S. Patent No. 5,864,178).

In regards to claim 1, Chia et al. ("Chia") discloses the following:

- a) a carrier (302) (For Example: See Figure 3);
- b) a chip (310), having an active surface with a plurality of bumps (314) thereon, wherein the chip is flipped over and bonded to the carrier in a flip-chip bonding process so that the chip and the carrier are electrically connected (For Example: See Figure 3);
- c) a heat sink (304), set over the chip, wherein the heat sink has a surface area greater than the chip (For Example: See Figure 3); and
- d) an encapsulating material layer (312), filling a bonding gap between the chip and the carrier and covering the carrier and part of the surface of the heat sink away from the chip is exposed (For Example: See Figure 3).

In regards to claim 1, Chia fails to disclose the following:

- a) the encapsulating material layer between the chip and carrier has a thickness such that the maximum diameter of particles constituting the encapsulating material is less than .5 times the said thickness.

However, Yamada et al. ("Yamada") discloses a semiconductor device that has an encapsulating material layer between the chip (118) and carrier (119) that has a thickness such that the maximum diameter of particles constituting the encapsulating material is less than .5 times the said thickness (For Example: See Figure 39, See Column 45 Lines 44-65 and Column 46 Lines 40-42). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Chia to include an encapsulating material layer between the chip and carrier that has a thickness such that the maximum diameter of particles constituting the encapsulating material is less than .5 times the said thickness as disclosed in Yamada because it aids in improving reliability (For Example: See Paragraph 31).

Additionally, since Chia and Yamada are both from the same field of endeavor, the purpose disclosed by Yamada would have been recognized in the pertinent art of Chia.

Finally, the following limitation makes it a product by process claim: a) "the encapsulating material layer is formed in a simultaneous molding process." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re*

Art Unit: 2822

Brown and Saffer, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 4, Chia fails to disclose the following:

- a) the encapsulating layer comprises a resin.

However, Yamada discloses a semiconductor device that has an encapsulating layer that comprises a resin (For Example: See Column 45 Lines 44-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Chia to include a resin as disclosed in Yamada because it aids in improving reliability (For Example: See Paragraph 31).

Additionally, since Chia and Yamada are both from the same field of endeavor, the purpose disclosed by Yamada would have been recognized in the pertinent art of Chia.

In regards to claim 5, Chia discloses the following:

- a) heat sink comprises metal (For Example: See Column 1 Lines 38-44).

In regards to claim 6, Chia discloses the following:

- a) an array of solder balls (306) attached to a surface of the carrier away from the chip (For Example: See Figure 3).

In regards to claim 8, Chia discloses the following:

- a) the carrier is selected from a group consisting of a packaging substrate or a lead frame (For Example: See Column 4).

Art Unit: 2822

7. Claim 3 is rejected under 35 U.S.C. 103(a) as obvious over Chia et al. (U.S. Patent No. 6,225,695) in view of Yamada et al. (U.S. Patent No. 5,864,178) and Dahl (U.S. Patent No. 6,051,888).

In regards to claim 3, Chia discloses the following:

a) an adhesive layer (308) set between the chip and the heat sink (For Example: See Figure 3).

In regards to claim 3, Chia fails to disclose the following:

a) a thermal conductive adhesive.

However, Dahl discloses a semiconductor device that has a thermal conductive adhesive (For Example: See Figure 6). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Chia to include a thermal conductive adhesive as disclosed in Dahl because it aids in sealing the device to the heat sink (For Example: See Paragraph 31).

Additionally, since Chia and Dahl are both from the same field of endeavor, the purpose disclosed by Dahl would have been recognized in the pertinent art of Chia.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as obvious over Chia et al. (U.S. Patent No. 6,225,695) in view of Yamada et al. (U.S. Patent No. 5,864,178) and Kumamoto et al. (U.S. Publication No. 2002/0109241).

In regards to claim 7, Chia fails to disclose the following:

a) at least a passive component set on and electrically connected with the carrier.

However, Kumamoto et al. ("Kumamoto") discloses a semiconductor device that has a passive component (140) on the carrier (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the

Art Unit: 2822

semiconductor of Chia to include a passive component as disclosed in Chia because it aids in providing an efficient package (For Example: See Paragraphs 5 and 8).

Additionally, since Chia and Kumamoto are both from the same field of endeavor, the purpose disclosed by Kumamoto would have been recognized in the pertinent art of Chia.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML

March 8, 2006

A handwritten signature in black ink, consisting of stylized, overlapping loops and a long horizontal stroke extending to the right.